AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in Charge]

By L. T. SAMUELS

At those stations with a sufficient period of record for the determination of approximate normals, upper-air temperatures during August averaged close to normal. (See table 1 and footnote thereon.) Upper-air relative humidities averaged mostly above normal with departures of small to moderate magnitude. Of especial interest is the high average relative humidity at El Paso at the 4,000- and 5,000-meter levels as compared to all other stations. The lowest average relative humidity at the highest levels occurred over Sunnyvale.

The resultant winds for the month were in general as follows (see table 2): Directions were in most cases close to normal. Marked changes, however, occurred at Albuquerque and Oklahoma City, where the directions were almost due south at 4,000 meters and due north at 5,000 meters, as compared to a normal westerly component. Velocities were mostly above normal at 3,000 meters and mostly below normal at 4,000 meters.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during August 1935*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Barksdale Field (Shreveport), La.[1] (52 m)	24.3		26.2		23.6		20.3		17.3		14.2		11.4		5.5		0.4		31
Billings, Mont.[2] (1,088 m)	16.5						18.6		15.9		12.8		9.3		2.1		−5.4		31
Boston, Mass.[1] (6 m)	19.1		19.8		16.9		13.6		11.0		8.3		6.1		0.3		−5.4		20
Cheyenne, Wyo.[2] (1,873 m)	15.1								16.5		16.3		13.9		6.5		−1.6		31
El Paso, Tex.[2] (1,194 m)	22.9						24.1		21.7		18.2		14.5		6.6		−0.3		31
Fargo, N. Dak.[2] (274 m)	15.8		18.7		17.3		15.4		12.6		9.9		6.8		0.5		−6.1		31
Kelly Field (San Antonio), Tex.[1] (206 m)	23.4		24.1		22.9		20.5		17.5		14.6		11.8		5.8		0.1		31
Lakehurst, N. J.[3] (39 m)	19.2		19.3		16.8		13.9		11.5		9.4		7.3		2.2		−3.2		31
Maxwell Field (Montgomery), Ala.[1] (52 m)	24.5		25.0		22.5		19.7		16.7		13.9		11.0		5.4		−0.2		28
Mitchel Field (Hempstead, L. I.), N. Y.[1] (29 m)	19.1		19.9		17.2		14.0		11.7		9.0		6.7		1.1		−4.7		30
Murfreesboro, Tenn.[2] (174 m)	22.2		23.6		21.2		17.7		14.5		11.5		8.4		2.5		−3.6		31
Norfolk, Va.[3] (10 m)	23.2	−0.8	22.9	−0.1	20.4	−0.3	17.9	+0.2	15.4	+0.7	13.1	+1.0	11.0	+1.5	6.0	+1.5	0.5	+1.4	28
Oklahoma City, Okla.[2] (391 m)	23.8		25.2		24.8		21.8		18.7		15.6		12.4		6.0		−0.1		31
Omaha, Nebr.[2] (300 m)	20.6	+1.3	22.8	+2.0	22.4	+0.8	20.4	+1.0	17.6	+1.1	14.9	+1.4	11.3	+1.1	4.6	+1.1	−1.4	+1.6	31
Pearl Harbor, Territory of Hawaii[3] (6 m)																			X
Pensacola, Fla.[3] (24 m)	25.3	0.0	24.0	+0.4	21.0	+0.2	17.8	+0.1	14.9	+0.2	12.0	+0.2	9.1	+0.2	3.1	+0.1	−1.9	+0.4	31
San Diego, Calif.[3] (10 m)	19.2	−1.6	19.6	+0.4	22.8	−0.1	21.6	−0.5	18.9	−1.3	15.5	−1.3	12.2	−1.2	5.4	−1.3	−1.3	−1.6	31
Scott Field (Belleville), Ill.[1] (135 m)	20.0		23.6		22.0		19.5		16.6		13.5		10.9		4.8		−0.5		28
Seattle, Wash.[3] (25 m)	12.7	(4)	13.6	(4)	13.3	−1.2	11.6	−0.8	9.6	−0.5	8.0	+0.1	6.1	+0.6	1.1	+1.0	−4.7	+1.0	25
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	18.6		20.1		17.7		15.0		12.6		10.0		7.1		1.5		−4.3		31
Spokane, Wash.[3] (596 m)	14.6				18.2		16.8		12.9		9.2		6.0		0.3		−6.3		31
Sunnyvale, Calif.[3] (10 m)	15.4	−2.2	16.1	+0.3	21.9	+1.3	20.9	−0.4	18.3	−1.1	15.5	−1.3	12.4	−0.5	5.9	+0.4	−0.5	+0.4	24
Washington, D. C.[3] (13 m)	20.8	−1.6	20.7	−0.6	18.3	−1.0	15.7	−0.8	13.4	−0.3	10.4	−0.5	7.8	−0.4	3.2	+0.2	−1.8	+0.8	30
Wright Field (Dayton), Ohio[1] (244 m)	19.4		21.3		19.2		16.3		14.2		11.4		9.0		3.2		−2.3		31

RELATIVE HUMIDITY (PERCENT)

Barksdale Field (Shreveport), La.	83		63		63		66		62		62		58		54		41		
Billings, Mont.	48						42		41		42		45		47		49		
Boston, Mass.	80		65		67		64		59		52		47		35		28		
Cheyenne, Wyo.	62								61		54		50		53		62		
El Paso, Tex.	64						53		51		55		61		75		77		
Fargo, N. Dak.	85		66		61		61		59		55		55		51		46		
Kelly Field (San Antonio), Tex.	92		85		65		61		63		58		53		50		46		
Lakehurst, N. J.	90		76		74		77		72		65		60		58		53		
Maxwell Field (Montgomery), Ala.	86		75		76		75		73		70		70		63		51		
Mitchel Field (Hempstead, L. I.), N. Y.	92		72		71		77		73		66		61		58		48		
Murfreesboro, Tenn.	88		70		70		76		73		70		65		57		46		
Norfolk, Va.	85	+5	74	+3	70	+3	67	+1	68	+1	63	−1	55	−5	48	−1	41	−1	
Oklahoma City, Okla.	72		70		66		66		65		62		61		61		56		
Omaha, Nebr.	79	−2	65	−5	55	0	51	−2	51	−2	50	−2	54	+2	53	+3	49	+1	
Pearl Harbor, Territory of Hawaii.																			
Pensacola, Fla.	88	+2	82	+3	83	+7	80	+6	78	+7	75	+7	72	+6	71	+6	66	+8	
San Diego, Calif.	89	+10	75	−2	50	+4	41	+4	40	+5	44	+7	47	+7	48	+5	46	+5	
Scott Field (Belleville), Ill.	88		62		61		55		55		54		47		43		37		
Seattle, Wash.	87	(4)	78	(4)	69	+3	66	+3	64	+4	57	+4	51	+5	39	+3	34	+3	
Selfridge Field (Mount Clemens), Mich.	87		73		73		68		60		58		56		56		50		
Spokane, Wash.	60				48		45		48		50		49		45		43		
Sunnyvale, Calif.	83	+7	75	−2	42	−5	33	+1	31	+4	30	+5	29	+5	28	+4	24	+4	
Washington, D. C.	84	+7	72	+3	73	+7	73	+6	67	0	67	+3	63	+3	53	0	51	0	
Wright Field (Dayton), Ohio.	88		73		71		73		61		57		53		53		47		

[1] Army. [2] Weather Bureau. [3] Navy.

[4] Departures omitted because of difference in time of observations this month and those on which normals are based. Observations taken about 4 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month: Norfolk, 140; Omaha, 146; Pensacola, 186; San Diego, 172; Seattle, 62; Sunnyvale, 75; Washington, 212.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 6 a. m. (E. S. T.) during August 1935*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N.Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	343	1.7	15	0.6	338	2.6	285	1.3	277	2.6	193	0.9	32	0.6	226	0.6	153	0.9	337	0.7	130	2.3	209	0.6	212	0.5
500	-----	-----	349	0.1	-----	-----	297	4.3	-----	-----	230	3.2	190	1.1	225	1.5	174	1.0	202	4.1	121	4.2	270	1.0	196	1.9
1,000	-----	-----	197	0.7	-----	-----	286	3.4	-----	-----	264	4.1	276	3.3	255	3.1	262	2.7	186	3.5	122	4.6	290	1.8	246	2.3
1,500	-----	-----	254	0.9	93	2.0	280	3.4	-----	-----	280	5.1	267	5.1	264	4.2	276	4.8	163	2.6	126	3.9	46	0.4	265	2.7
2,000	71	0.7	270	1.0	147	0.6	287	3.0	262	3.0	273	6.0	267	5.4	275	6.4	279	6.1	153	2.6	127	3.6	73	0.7	268	2.5
2,500	193	1.8	235	1.1	259	3.2	277	4.0	231	4.5	275	7.0	267	5.3	273	7.1	272	8.0	136	2.2	126	3.7	235	2.7	264	2.4
3,000	212	2.2	216	0.4	260	6.2	283	4.1	242	4.7	288	7.3	264	5.4	273	7.5	271	9.6	118	2.0	111	3.6	225	4.8	254	2.6
4,000	190	1.0	320	1.3	265	11.5	297	2.5	265	4.7	290	7.5	285	8.1	271	8.6	292	10.5	108	2.3	112	2.9	235	6.2	288	2.7
5,000	28	2.2	262	1.3	265	12.7	37	2.3	257	6.3	-----	-----	-----	-----	-----	-----	-----	-----	104	3.1	-----	-----	244	8.0	-----	-----

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii [1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	353	0.9	331	0.9	174	3.0	153	1.7	48	2.4	353	1.6	187	0.4	155	3.2	290	0.4	134	0.3	104	1.3	105	1.2	5	0.6
500	316	2.8	246	2.2	185	6.5	181	4.9	70	7.1	262	0.4	223	2.8	-----	-----	130	0.5	205	1.4	15	3.3	-----	-----	317	3.5
1,000	298	3.2	294	2.0	206	13.1	215	7.4	72	7.7	257	0.7	265	3.0	-----	-----	84	2.0	248	3.7	14	2.6	263	1.2	303	4.0
1,500	278	4.4	239	0.7	211	9.6	234	6.9	75	6.5	336	0.2	271	3.9	166	5.3	113	2.6	254	3.7	1	1.0	268	2.3	296	4.9
2,000	288	6.0	205	1.7	220	5.8	251	6.2	85	4.4	52	1.1	280	4.2	189	3.9	120	3.8	278	5.8	281	1.2	252	3.2	291	6.6
2,500	291	7.3	169	3.5	220	3.0	269	5.1	49	3.1	68	1.3	289	4.6	216	3.3	116	2.9	283	6.4	241	1.6	258	5.0	285	7.7
3,000	313	8.9	191	3.0	198	2.0	260	4.4	43	2.7	24	1.1	300	4.9	238	3.8	131	4.3	286	7.6	255	2.8	260	7.0	285	7.6
4,000	-----	-----	-----	-----	174	1.2	284	5.7	-----	-----	32	1.6	294	4.3	236	4.3	117	5.0	-----	-----	267	6.5	259	10.6	287	4.4
5,000	-----	-----	-----	-----	28	1.6	314	2.4	-----	-----	-----	-----	304	3.3	247	5.1	111	2.0	-----	-----	281	6.9	274	10.3	273	6.1

[1] Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES, in charge]

By RICHMOND T. ZOCH

Unusually heavy rains occurred over the Muskingum River Basin in Ohio on August 6 and 7. The resulting floods caused considerable damage and the loss of five lives. A detailed report on this flood will appear in a later issue of the REVIEW.

There were a number of floods in the small streams of Arizona, the most important being those of the 22d, near Wickenburg, which made 35 persons homeless; and on the 28th, near Dragoon, which overturned a transcontinental bus and drowned 5 persons.

The other floods of August were not of great importance.

HEAVY RAIN IN TEXAS, MAY 31

A very heavy rain and resulting flood occurred on May 31 near D'Hanis, Tex., in the Nueces River Basin; a report recently prepared by the official in charge, Weather Bureau Office, San Antonio, Tex., is of unusual interest and is printed in full below:

An excessive rainfall of great intensity occurred in Medina County, Tex., on May 31, 1935. Saco Creek flooded the town of D'Hanis, washed away 17 small houses, a mile or more of the Southern Pacific tracks, and a section of the highway. Five persons were drowned.

The Saco Creek Basin is approximately 50 miles west of San Antonio, and the watershed has an area of about 80 square miles. This section was visited by Mr. Dalrymple, an engineer from the United States Geological Survey, Austin, Tex., and J. H. Jarboe, United States Weather Bureau, San Antonio, Tex. An effort was made to determine amounts of rainfall and estimate the discharge. All available rainfall measurements were checked and crest stages at ranch houses examined. A rock house on the Lutz ranch, built in 1851, was flooded for the first time, and the highest water stages known occurred at all ranches.

The number of rainfall measurements is too small to support a definite statement of amounts. A circular water tank at the Woodward ranch, cleaned and dry before the rain as affirmed by all, is the best measurement obtained. This tank holds 21.84 inches, and ran over in less than 3 hours. A carbide can that holds 11.5 inches ran over at the Lutz ranch, as did a dip can hanging from a branch of a tree at another ranch. The last measured 13 inches. All ranchmen state that the rain fell in less than 3 hours. Using the